REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-14 are pending in the application; Claims 1, 2 and 5-12 are amended; Claims 13 and 14 are added; and Claims 3 and 4 are withdrawn by the present amendment. Support for amended independent Claims 1, 2, 11 and 12 can be found in the original specification, claims and drawings.[1] New Claims 13 and 14 recite the same subject matter as amended Claim 10 but dependent from Claims 8 and 9, respectively. No new matter is presented.

In the outstanding Official Action, Claims 1-2, 5-6 and 11-12 were rejected under 35 U.S.C. § 112, second paragraph, as indefinite; Claims 7-10 were objected to under 37 C.F.R. § 1.75(c) as multiple dependent claims depending from another multiple dependent claim; and Claims 1-2 were rejected under 35 U.S.C. § 103(a) as unpatentable over Isao et al. (JP Patent Abstract 09-183033, hereinafter "Isao") in view of Kish (U.S. Patent 5,305,992, hereinafter "Kish").

Claims 1, 2, 11 and 12 under 35 U.S.C. § 112, second paragraph, because the phrase "said loading sensing element is not substantially deformed by an applied load" was cited in the outstanding Official Action as indefinite. In response, Claims 1, 2, 11 and 12 are amended to recite "said load sensing element is not deformed by more than 5.0 μm by an applied load". Support for this feature can be found, for example, at p. 13, lines 5-12 of the specification, which describes that the required machining accuracy is 5.0 μm, and therefore the claimed load sensing element is compressed less than this value.

Accordingly, Applicants respectfully request that the rejection of Claims 1-2, 5-6 and 11-12 under 35 U.S.C. § 112, second paragraph, be withdrawn.

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[1] Specification p. 13, lines 5-12.

Claims 7-10 were objected to under 37 C.F.R. § 1.75(c) as improper form as multiple dependent claims depending from another multiple dependent claim. In response, Claims 7-9 are amended to depend from only one of Claims 1 and 2, and Claim 10 is amended to depend from Claim 7 only. New Claims 13 and 14 are added which recite substantially the same subject matter as amended Claim 10, but depend from Claims 8 and 9, respectively.

Accordingly, Claims 7-10 are no longer multiple dependent claims depending from another multiple dependent claim, and Applicants respectfully request that the objection to Claims 7-10 under 37 C.F.R. § 1.75(c) be withdrawn.

The outstanding Official Action rejected Claims 1 and 2 under 35 U.S.C. § 103(a) as unpatentable over Isao in view of Kish. Applicants respectfully submit that amended independent Claims 1 and 2 state novel features clearly not taught or rendered obvious by the applied references.

By way of background, workpiece supporting devices typically include a clamping mechanism and/or a fixing mechanism for holding a workpiece, and a load sensor for detecting a clamping force and/or a fixing force acting on the workpiece. Generally, these devices include separate sensors for detecting each of the fixing force and the clamping force, respectively. Further, these devices typically include a strain gauge or other similar sensor that functions by way of elastic deformation, therefore decreasing the machining accuracy of the workpiece supporting device.

In view of the above-noted shortcomings, the present inventors arrived at the claimed apparatus. Specifically, the present invention allows for a workpiece supporting device to detect an abnormal clamping and an abnormal overload with high accuracy. As recited in amended Claim 1, the workpiece supporting device includes work table relatively movable to a tool and which supports a workpiece. A clamping member is also provided which clamps the workpiece relative to the work table. The workpiece support device includes plural

seating mechanisms between the workpiece and the work table to detachably support the workpiece on the work table. Each of the seating mechanisms includes a load sensing element assembled to receive a ***clamping force***, and the load sensing element is ***not deformed by more than 5.0 μm by an applied load***.

Providing a plurality of load sensing elements between the workpiece and the work table allow the apparatus to simultaneously detect a clamping force and a fixing force on the workpiece. Further, as the load sensing element is not deformed by more than 5.0 μm (allowable machining error), the apparatus does not substantially adversely affect the accuracy of the machining device.

Turning to the applied references, Isao describes a moving mechanism (34) for moving a bracket (30) in a clamping direction.[2] Either a fixed clamp piece (31) or a movable clamp piece (32) is provided with a detection means (35), such as a load cell, for detecting the force on the workpiece (Wb).[3] The moving mechanism (34) is then controlled so that the bracket (30) is moved to a predetermined position based on the signal of the load cell (35).

Significantly, the load cell (35) is positioned in the clamp piece (31) and not in a seating mechanism, as recited in amended Claim 1. Further, Isao fails to teach or suggest that the load cell (35) is not deformed by more than 5.0 μm by an applied load. Finally, as admitted in the outstanding Official Action, Isao fails to disclose a plurality of seating mechanisms provided which include the load sensing element.[4] In an attempt to cure the deficiencies of Isao in this respect, the outstanding Official Action turns to Kish.

Kish describes a workpiece retention assembly including a plurality of measuring fixtures for supporting and positioning a workpiece. The measuring fixtures are aligned along a matrix platform and each includes a selectively adjustable stanchion and a selectively

[2] Isao Abstract
[3] Id.
[4] Official Action p. 3.

rotatable clamping member for retaining the workpiece.[5] Kish further describes that a measuring fixture (20) provides reference points for an inspection probe to coordinate a measuring machine which measures the dimensions of the workpiece based on the positions of the plurality of clamping members.[6]

The requirements for a *prima facie* case of obviousness are (1) there must be some suggestion or motivation in references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the reference or to combine the reference teachings (2) there must a reasonable expectation of success, and (3) the prior art reference must teach or suggest all the claim limitations. It is respectfully submitted that the outstanding Official Action fails to make a *prima facie* case of obviousness, because neither Isao nor Kish, neither alone or in combination, teach nor suggest all the claim limitations.

Amended Claim 1 recites, *inter alia*, a workpiece supporting device, comprising:

> ...plural seating mechanisms disposed ***between said workpiece and said work table to support detachably said workpiece on said worktable***...

The outstanding Official Action asserts that Isao discloses a single seating mechanism including a load sensing element. However, the Official Action fails to address the claimed feature that the seating mechanisms are disposed ***between said workpiece and said work table to support detachably said workpiece on said worktable***, as recited in amended Claim 1. In fact, Isao's device does not include a work table whatsoever, much less a work table capable of detachably supporting a workpiece, as recited in amended Claim 1.

Specifically, Isao describes that a fixed clamp piece (31) and a movable clamp piece (31) are provided on either side of the workpiece (Wb), and are both in direct contact with the workpiece while it is clamped. A detection means (35) is provided at either the fixed clamp piece (31) or the movable clamp piece (32), to determine the force placed on the

[5] Kish Abstract.
[6] Id. col. 3, lines 3-12.

workpiece by the clamps (31/32). However, Isao's device does not include a seating mechanism that is disposed ***between said workpiece and said work table to support detachably said workpiece on said worktable***, as recited in Claim 1. In contrast, Isao describes that the workpiece is clamped directly between the clamping mechanisms (31/32), and therefore the workpiece is only supported by the clamping members. Thus, no ***seating mechanism*** is provided ***to support detachably said workpiece on said worktable***, as recited in amended Claim 1.

Kish also fails to teach or suggest a work table as recited in amended Claim 1, because the work table of Kish is not ***relatively movable to a tool and supporting a workpiece***. Specifically, Kish describes that the purpose of his measuring fixture is to properly determine the dimensions of a piece of material by clamping it onto the measuring fixtures, then feeding the measurements to some type of coordinate measuring machine.[7] Therefore, the matrix platform (14) of Kish could not possibly be considered analogous to the work table recited in amended Claim 1, because it is not ***relatively movable to a tool.***

Accordingly, Applicants respectfully submit that neither Isao nor Kish, either alone or in combination, teaches or suggests ***a work table relatively movable to a tool and including seating mechanisms disposed between the workpiece and the work table to detachably support the workpiece on the work table***, as recited in amended Claim 1.

Further, amended Claim 1 recites, *inter alia*, a workpiece supporting device, wherein

> ...said load sensing element is ***not deformed by more than 5.0 μm*** by an applied load...

The outstanding Official Action relies on Isao as teaching a load sensing element (35) in the form of a load cell, as described in the Isao abstract.[8] However, Isao fails to teach or

[7] Kish col. 3, lines 3-11.
[8] Official Action, p. 3.

suggest that the load cell (35) ***is not deformed by more than 5.0 μm***, as recited in amended Claim 1.

As described in the "Description of Related Art" section of the present specification, load cells function by elastic deformation of a sensing body (load cell) by a clamping or fixing force. Therefore, in conventional load cells, a reference position is displaced by the applied force causing an unacceptable level of decrease in machining accuracy, which results in a machined piece becoming deformed or otherwise defective. To solve this problem, the present invention includes a load cell that ***is not deformed by more than 5.0 μm***, which is within an acceptable machining accuracy, as described above.

However, while Isao describes the use of a load cell (35) to detect the force applied on a clamped workpiece, Isao fails to teach or suggest that machining accuracy is taken into consideration when selecting the load cell, much less that the load cell (35) ***is not deformed by more than 5.0 μm***, as recited in amended Claim 1.

Accordingly, for at least the reasons discussed above, Applicants respectfully request that the rejection of Claims 1 and 2 under 35 U.S.C. § 103 be withdrawn.

Consequently, in view of the present amendment and in light of the foregoing comments, it is respectfully submitted that the invention defined by Claims 1-2 and 5-14 is definite and patentably distinguishing over the applied references. The present application is therefore believed to be in condition for formal allowance and an early and favorable reconsideration of the application is therefore requested.

Respectfully submitted,

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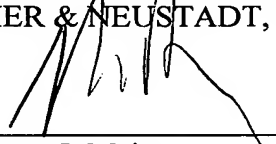

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